

**Northwest Power & Conservation Council**  
**Systems Analysis Advisory Committee**  
**April 5, 2023**

John Ollis, NWPCC, began the meeting at 9:00am by calling for introductions. Chad Madron, NWPCC, explained how to best interact with the Go-to-Webinar platform.

**Review 2022-2023 Wholesale Market Study Results**  
**Dor Hirsh Bar Gai NWPCC, John Ollis, NWPCC**

Rob Diffely, BPA, asked if the 110 GW baseline is from 2023-2027 [Slide 12]. Ollis answered yes, it represents the cumulative build by that date. Diffely thought 25 GW would be built in the NW. Ollis agreed, adding that most of the build is backloaded.

Diffely asked if there are any new assumptions around transmission availability. Ollis confirmed he was asking about a firm transmission product for a resource before answering that there are no new assumptions about contracting challenges adding that most studies assume that contracting details are sorted out by the market.

Rick Williams, PSU, asked for scenario that looks at more transmission disruptions from the WECC boundary system to the Northwest, referencing incidents at Path 65 and 66. He said planning for resources that the bulk power system might not be able to deliver could be a problem for the region. Ollis agreed, noting that one of the last slides addresses this issue. He pointed to prior work and a desire to do a deeper build out. Ollis thought the SAAC would be a good place to talk through the issue further.

Laura Buford, BPA, asked if the baseline scenario includes carbon pricing where it exists and tax incentives from the Inflation Reeducation Act. Ollis said yes to emission pricing in BC, WA, and CA but no emissions pricing elsewhere or in any of the other scenarios. He then said the assumptions were run before the Inflation Reduction Act passed but the next study should include it.

Ryan Fulleman, Tacoma Power, asked if the High WECC Demand scenario does not include electrification assumptions for the SW region in the chat. He then wrote: Electrification is increasingly in some utilities' basecase forecast. Does this scenario add additional electrification or separate out existing basecase electrification to utility forecasts.

Hirsch Bar Gai thought it was showing a 7% load increase. Ollis thought that might be an early number and offered to follow up with more detail. Hirsch Bar Gai then said that they were including that load increase through the region.

Fulleman then asked if the increased WECC demand from electrification includes these updated utility electrification basecase scenarios. Ollis moved to [Slide 7] and said yes, clarifying that the

high WECC demand did not include more aggressive demand in the SW, but did in CA, the Pacific NW, BC, and Alberta. Ollis said these places had better data and policy in place.

Renchang Dai, PSE, asked about the granularity of the study. Ollis explained that AURORA uses the West Interconnect Zonal Representation and sorts by BA. He said this is to try to show transmission limitations which drives builds. Renchang suggested coordinating with long-term transmission planners. Ollis agreed, saying they intend to look at this more and asked for suggestions. He then said he's seeing a lot of storage builds that look like ways to defer transmission builds.

Brian Dombeck, BPA, asked about the outlier asymmetry of the example box-and-whisker plot on [Slide 22.] Hirsch Bar Gai explained that a handful of minor outlier are excluded at the start and the minimum is not the true minimum. He suggested focusing on the 50<sup>th</sup> percentile.

Dombeck rephrased his question, asking about "up to 1.5 x (IQR)" and if that matches what was done on the top. Hirsch Bar Gai said yes this is just a representation. Ollis added that there can be outliers on the top or bottom and Dombeck's interpretation is correct. Ollis said the data has so many outliers it would be hard to represent, so this was a way to zoom in on the range.

Dombeck asked if there was a hard threshold for large outliers. Dan Hua, NWPCC, spoke to the example box-and-whisker plot, saying the asymmetry is there to show that asymmetry is possible. Hua then explained the limitations of the whisker.

Hirsch Bar Gai thought the maximum was \$300 and the minimum was -\$200. Ollis said prices rarely go below -\$50, calling it the lowest clean energy premium price. He then said for high prices, anything above a few hundred looks like a planning-level loss of load event as AURORA starts digging into emergency resources. Ollis said there were not too many of those and reminded the room that this is not an adequacy study.

Dai asked if each box-and-whisker plot represents 30 samples. Hirsch Bar Gai answered yes, saying there will be plots on an hourly perspective and by period. He said it is not a full 8760 but they use partial monitoring from AURORA. Ollis said it's an AURORA sample over 30 conditions.

Tomás Morrissey, PGE, asked how many observations are in a single box-and-whisker plot [Slide 23]. Ollis answered that since it's a sample of a day of a month, and not every hour one of January, February, March. He said it is not the full 8760 but is 30 water conditions.

Hua said the middle bar of the graphs on [Slide 24] represents the 50<sup>th</sup> percentile. He noticed that over 50% have negative pricing and wondered if a power system could operate like that. Ollis said there is a "Persistent Negative Pricing: Do You Believe It" slide coming up and maybe we don't. He suggested talking about this later in the presentation.

Rachel Clark, Tacoma Power, looked forward to that conversation. She then asked if part of this is driving by the climate model assumptions, the massive renewable build, or both. Hirsch Bar

Gai said they use the same climate assumptions, but the main driver is CA and the WECC building out to summer peaks and interacting with hydro.

Clark then asked if AURORA adjusts hydro availability based on the climate models which would show more winter availability. Ollis answered yes. Clark then asked about adjustments to the load forecast. Ollis agreed with that as well, calling both assumptions aligned. He spoke about AURORA's bid adder for renewables and clean energy that is calibrated. Ollis said this is an honest attempt to show how policy would influence mid-day pricing as we get closer to 2030.

Blake Scherer, Benton PUD, noted that the scales looked optimized for each decade and suggested setting graphs by season. Hirsh Bar Gai agreed that there is a change and said they were trying to be specific to each distribution.

Dai reiterated that it looks like renewables are being overbuilt to meet load and wondered if a negative planning reserve margins and a \$0 wheeling price is possible. Hirsh Bar Gai said these scenarios do not include an organized market and the wheeling costs and PRM are default in AURORA. Ollis said the PRM is calibrated to individual planning areas and some things have changed but none were zero.

Ollis then said sometimes of day look like an overbuild of renewables while other times of day it looks like there is not enough resource. He added that batteries are not enough to flatten those costs out at this time so the strategy is to invest more in renewables and curtail versus building more storage.

Fulleman agreed, saying it makes sense as you move from the 2030s to the 2040s. He then asked about AURORA, wondering if the hourly profile changes year over year. Ollis said yes for demand, but the changes are known in more detail in some places.

Hua clarified that the NW uses the climate change data while outside the region uses historical. Ollis said it's a hodgepodge of forecast and historical, but they know CA very well because of their public hourly data sets.

Morrissey praised the box-and-whisker plots and asked if prices could also be grouped by heavy load, light load, hour, and flat. Ollis said yes.

Hua asked why prices on [Slide 28] is so high from 10pm to 12am. Ollis said there's no sun and limited amount of night storage.

Clark has been attributing this spike to running out of batteries by 10pm but wondered if that could be optimal. Ollis said it depends on how you imagine the system being used. He thought some of it might be an AURORA anomaly, but this was what getting rid of emissions in the cheapest way possible, (running gas turbines at night) looks like.

Williams wondered how various scenarios of a new Columbia River Treaty would look, adding that the flood control regime will change in 2024. Ollis said they are modeling a persistence of the current regime until we know more.

## **BREAK**

Clark understood the emission volatility coming from tradeoffs [Slide 57] and asked about the volatility from the Persistent Global Instability scenario as she heard it described as high gas prices. Ollis agreed, saying the coal prices don't have much volatility. He thought for the Persistent Global Instability scenario it was from high gas prices making you cross that threshold between coal and gas more often. Ollis offered to dig in further offline.

Scherer asked about emission prices in the bottom right box wondering how to interpret all of the outliers. Hua explained that the plot is a summary of the statistics, where the boxes are the central 50% of the population and the other half of the population lies above or below.

Scherer asked how to interpret two plots with the same box size but two very different whisker length. Hua suggested focusing on the black diamonds in the box. Ollis stressed that the outliers do drive the average.

## **Council Tools and Gaps**

Hirsh Bar Gai explained the Menti.com platform to give instant feedback. His first questions: "Which aspects would you improve in your own capital expansion modeling?" generated a word cloud that included: Transmission and Long duration storage.

The second question: "What aspects of the Council's capital expansion modeling need improvement?" generated a word cloud that included: Organized markets, transmission assumptions, demand flexibility and hydro flexibility.

Ollis talked about future topics, noting that many things the Council is looking at are listed in the word clouds. He said they will share the Menti results and promised to discuss these topics further.

Ollis thanked the room and ended the meeting at 12:00pm.

## **Attendees In-Person and Via Go-to-Webinar**

John Ollis, NWPCC

Dor Hirsh Bar Gai, NWPCC

Dan Hua, NWPCC

Chad Madron, NWPCC

Laura Burford, BPA

Joel Ainsworth, BPA

Frank Brown, BPA

Gillian Charles, Red Kite Consulting

Hailey Choi, BC Hydro

Rachel Clark, Tacoma Power

Dylan Dsouza, NWPCC

Renchang Dai, PSE

Robert Diffely, BPA

Brian Dombeck, BPA

Ryan Fulleman, Tacoma Power

Eric Graessley, BPA

Massoud Jourabchi, NWPCC  
Alexandra Karpoff, PSE  
John Lyons, Avista  
Jennifer Magal, PSE  
Ian Mcgetrick, Idaho Power  
Barbara Miller, US ACE  
Tomás Morrissey, PGE  
Bryan Neff, CEC  
Heather Nicholson, Orcas Power & Light  
Joel Nightingale, WA UTC  
Craig Patterson, independent  
Amy Pryse-Phillips, BC Hydro  
Landon Snyder, Snohomish PUD

Erin Riley, BPA  
Blake Scherer, Benton PUD  
Steven Simmons, NWPCC  
Kevin Smit, NWPCC  
Tyler Tobin, PSE  
Rick Williams, PSU  
Joomin Yeom, BC Hydro  
Brian Dekiep, NWPCC  
Laura Burford, BPA  
Ryan Egerdahl, BPA  
Kathy Lee, BC Hydro